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June 1982

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Issue focus:
Mechanical pulping
Pulpwood processing

Niagara of Wisconsin expansion 153

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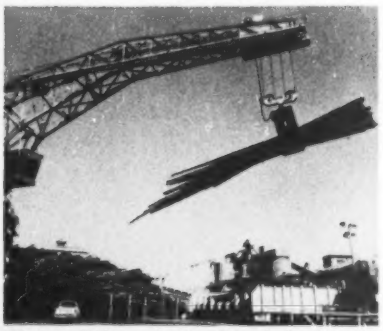
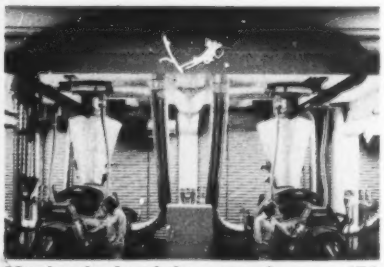


State-of-the-art woodyard design 90



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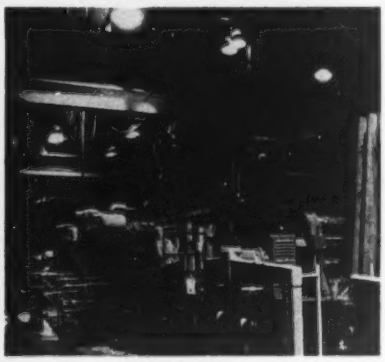

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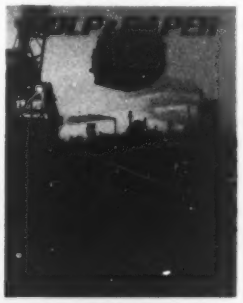
COVER: *Pulpwood processing is vividly exemplified by this late-afternoon, time-exposed photo of Chesapeake Corp.'s recently modernized woodyard at West Point, Va. (Photo by Lee Brauer, courtesy of Kennedy & Green Agency, Richmond, Va.)*



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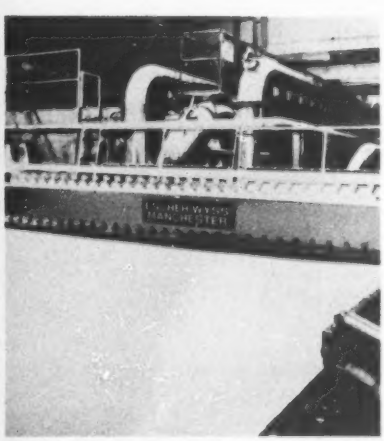

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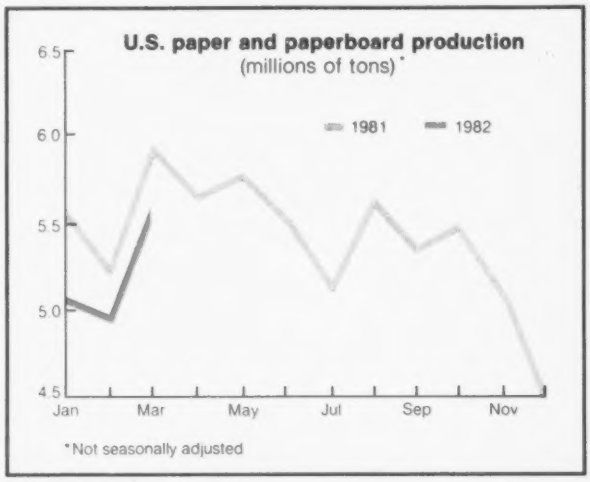
MONTH IN STATISTICS

U.S. paper and paperboard production in March totaled 5.6 million short tons, about 4% below March 1981 levels, according to the American Paper Institute. Adjusted for seasonal and workday factors, the average rate of production for the first quarter of 1982 was about 61 million tpy, 3.5% below the cyclical peak reached in the first quarter of 1981, but 1% above fourth-quarter 1981.

Among major grades, newsprint production continued to show the only strength, and its 7% gain over year-earlier levels for the quarter was offset by modest declines in the other paper grades. Also for the quarter, printing/writing paper production was 2.6% below its year-ago total, tissue was off 1.8%, and packaging papers down about 1%. Paperboard output in the quarter was down 6.4% from its year-ago level, with an 8% decline in containerboard, a 5.5% decline in boxboard for domestic use, and a 7% fall-off for folding boxboard.

Total Canadian newsprint shipments in March came to 749,000 metric tons, down 2.7% from a year earlier, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates were 91% vs 98% a year earlier.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	March	466	6.2	5,358	7.2
Uncoated groundwood (s)	March	127	4.1	1,382	−5.1
Coated paper (s)	March	432	−1.4	4,901	−2.3
Uncoated free sheet (s)	March	671	−5.8	7,795	−2.5
Unbleached kraft packaging and industrial (s)	March	343	−5.2	3,912	−4.2
Tissue	March	385	−2.5	4,419	−1.8
Total paper	**March**	**2,714**	**−1.3**	**31,041**	**−0.6**
Kraft linerboard, unbleached	March	1,272	−2.6	13,945	−6.2
Semichemical medium	March	395	−8.1	4,488	−8.6
Bleached paperboard	March	333	−9.5	3,769	−7.7
Recycled paperboard	March	615	−3.9	6,946	−6.0
Total paperboard	**March**	**2,716**	**−4.4**	**30,277**	**−6.4**
Total paper and paperboard*	**March**	**5,578**	**−3.9**	**62,966**	**−4.5**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	February	4,188	1.5	49,498	−3.2
Market pulp production	February	533	5.8	5,743	−6.2
Wastepaper consumption at paper/board mills	February	1,221	0.8	14,634	−5.2
Pulpwood consumption (cords)	February	6,509	−2.9	77,430	−2.1
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	March	21.218	−2.0	58.858†	−6.2
Containerboard inventories at box plants	Mar. 1	2,468	21.6		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	February	611	−12.7	7,720	−7.0
Imports of Canadian newsprint	February	524	−15.3	6,633†	−5.4
U.S. paper exports (including products)	February	322	−11.0	3,788	−14.9
Exports of unbleached kraft linerboard	March	180	0.6	1,906	5.2
Exports of woodpulp	February	303	8.6	3,143	−8.2
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	March	749	−2.7	2,129†	−1.0
Operating rates	March	91%	98%	94%	97%
Inventories held by U.S. consumers	Mar. 31	1,669	29.8		
Woodpulp shipments (export only)	March	n.a.	n.a.	n.a.†	n.a.
Operating rates	March	n.a.%	n.a.%	n.a.%	n.a.%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

FINANCE

U.S. paper profits plummet in first quarter

U.S. pulp and paper companies reported dismal earnings for the first quarter of 1982 as persistently depressed markets cut into profit margins and price structures weakened. Pulp and paper companies saw earnings fall 42.3% below year-earlier levels on a 2.0% decline in sales, according to a PULP & PAPER survey of 27 firms. First-quarter after-tax profit margins fell to 3.8% from 6.3% in the first quarter of 1981.

An even blacker picture was painted by seven more companies with large forest product holdings, who reported earnings down 59.3% on a 9.3% decline in sales. First-quarter earnings for the total paper/forest products industry dropped 47.1%.

IP profits tumble. International Paper Co. reported earnings down 59.3% to $60 million in the first quarter. The company's 1982 results included an after-tax gain of $17.2 million from the sale of tax benefits, while 1981 results included a $57-million gain from major land transactions.

Well over three-fourths of the paper companies for which results were available reported earnings below year-earlier levels or actual losses. Crown Zellerbach Corp. posted an earnings decline of 69.6%, attributable primarily to the depressed housing industry but also due to the poor performance of Crown Zellerbach Canada, which reported a substantial loss for the quarter. Mead Corp., reporting an earnings falloff of 54.0%, saw weakened demand in paper, paperboard, and pulp areas reduce prices and profit margins. St. Regis Paper Co., with earnings down 61.0%, also cited nonrecurring factors. Union Camp reported a 19.4% decline in profits in the quarter, with shipments of paper products down 9% from a year earlier.

Among the few bright spots, Great Northern Nekoosa Corp. saw profits rise 3.8%, helped by a substantial increase in the investment tax credit related to its new pulp mill near Hattiesburg, Miss. Federal Paper Board Co. said a lower tax rate for the quarter helped push profits up 8.1%, and Fort Howard Paper Co. reported a record first quarter, aided by lower fiber costs, with profits up 10.2%.

Dismal wood products. Companies most heavily involved in wood products continued to be hardest hit in what is seen as the longest depression in homebuilding since World War II.

Boise Cascade Corp.'s profits fell 85.2% due to the housing slump and softening in paper markets, which resulted in downtime at some of its mills. Champion International saw profits tumble 97.8%, despite an increase in operating income from its paper operations. And Georgia-Pacific Corp.'s earnings fell 51.9%. Weyerhaeuser Co., in comparison, reported earnings almost even with a year ago. And Pope & Talbot Inc., helped by profitable pulp and paper operations and increased cutting of low-cost fee timber, posted earnings up 39.3%.

Canadian profits nose dive. Weakened demand for newsprint and kraft pulp, combined with the effects of the depressed housing market, caused Canadian pulp and paper company first-quarter profits to plummet from year-earlier levels, according to reports in from ten major producers. Earnings were down 87% on a 9% decline in sales, bringing profit margins to 0.7%, compared with 4.9% in first-quarter 1981.

Five companies reported actual losses for the quarter, while all but one of the remainder posted profit declines.

U.S. PAPER/FOREST PRODUCTS RESULTS

First quarter ($000)

Paper companies	Sales	Change 1982/81	Earnings[1]	Change 1982/81
Chesapeake	$59,600	−6.6%	$1,900	−67.8%
Clevepak	31,079	5.9	949	0.1
Consolidated	135,816	−1.1	10,905	−29.7
Crown Zellerbach	725,000	−5.3	5,600	−69.6
Diamond	264,979	−14.4	2,204	−73.1
Federal Paper	123,015	8.0[2]	5,348	8.1[2]
Fort Howard	120,295	8.4	21,803	10.2
Glatfelter	68,696	29.3	5,774	150.7
GN Nekoosa	367,900	0.5	22,000	3.8
Hammermill	325,916	5.7	7,080	−34.1
Intl. Paper	1,002,700	−23.2	60,000[3]	−59.3
James River (1/24)[4]	184,250	−1.6	4,391	−5.9
Kimberly-Clark	734,300	0.1	57,700	−4.2
Longview (1/31)[4]	92,912	11.0	(2,185)	n.m.
Mead	689,866	2.6	13,803	−54.0
Mosinee	22,021	−6.1	1,022	−41.6
Pentair	67,865	17.0	2,223	−19.5
St. Regis	672,230	−9.8	19,430	−61.0
Scott	580,156	2.5[2]	18,639	−27.9[2]
Sonoco	122,953	−4.2[2]	6,667	−13.8[2]
Sorg	19,932	−8.8	(98)	n.m.
SW Forest	144,948	−27.6	(4,603)	n.m.
Stone Container	105,442	2.3	2,556	−58.6
Union Camp	372,433	−10.6	32,241	−19.4
Wausau (2/28)[4]	44,833	−5.6	(864)	n.m.
Westvaco	342,644	−5.4	8,323	−57.4
Willamette	214,305	−12.2	(4,652)	n.m.
Total	**7,906,086**	**−3.1**	**296,156**	**−42.3**
Forest Products				
Boise Cascade	713,960	−9.0	5,560	−85.2
Champion Intl.	905,913	−9.5	617	−97.8
Georgia-Pacific	1,199,000	−11.1	25,000	−51.9
Louis.-Pacific	196,570	−26.4	(11,750)	n.m.
Pope & Talbot	59,633	−4.0	857	39.3
Potlatch	201,308	−7.9	4,485	−43.6
Weyerhaeuser	1,057,457	−3.7	56,952	−0.1
Total	**4,333,841**	**−9.3**	**81,721**	**−59.3**
U.S. total	**12,239,927**	**−5.4**	**379,877**	**−47.1**

CANADIAN PAPER INDUSTRY RESULTS

Abitibi	C$414,618	0.9%	C$22,019	−21.5%
B.C. Forest	198,300	−2.9	(4,700)	n.m.
B.C. Resources	143,200	−35.9	(13,000)	n.m.
Con-Bathurst	362,600	1.6	17,600	−32.8
Doman	30,600	−1.0	(7,700)	n.m.
Fraser	102,734	8.4[2]	143	−97.0[2]
Great Lakes	132,275	−4.7	12,179	−42.0
Mac. Bloedel	505,000	−17.5	(10,400)	n.m.
Scott	52,900	9.3	2,200	10.0
Weldwood	99,700	−23.2	(4,047)	n.m.
Total	**2,041,927**	**−9.2**	**14,294**	**−87.1**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. 1981 figures restated by company.
3. 1982 results include after-tax gain of $17.2 million from sale of tax benefits. 1981 results include after-tax gain of $57 million from land transactions.
4. Period ended. Figures for James River are for third quarter, Wausau for second quarter.

n.m. = not meaningful

LABOR

Abitibi workers vote for strike action

Negotiations between the Canadian Paperworkers Union and Abitibi-Price Inc., which broke off Apr. 7, resumed on May 11, the day after the union counted strike votes taken at the 11 Abitibi mills where contracts expired Apr. 30, according to Aurele Ferlatte, secretary-treasurer of CPU. Ferlatte said 74.5% of the Abitibi workers voted in favor of a strike, and that by May 15 there would be a settlement or the union would proceed with strike action.

According to CPU, monetary issues would not be discussed with other companies during labor negotiations in eastern Canada until a salary and benefits settlement was reached with Abitibi. CPU, which represents most pulp and paper workers affected by this year's bargaining in eastern Canada, made the announcement when the union refused to respond to the company's offer of an 8% increase in wages with a minimum of C$1.00 the first year and a 7½%-increase in the final year of a two-year contract. The union is willing to settle for 15%/13%, said Ferlatte, which would equal the increase achieved by western Canadian paperworkers last year but would keep some differential between wage rates in the East and West.

• **Glatfelter to shut down.** Operations at P.H. Glatfelter Co.'s 225-tpd fine papers mill in West Carrollton, Ohio, were shut down by the company on Apr. 11 because of an expired labor contract with about 250 of the mill's workers who are members of United Paperworkers International Union. The three-year contract, which ran out on Apr. 5, allowed the company to temporarily close the mill if the contract lapsed. Negotiations are continuing, a mill executive said.

• **American Can pact.** American Can Co. reached a three-year settlement with 463 UPIU members at its Halsey, Ore., toweling/tissue mill. The new contract, which runs from Feb. 1, 1982 through Jan. 31, 1985, provides for wage increases of 9%/7.63%/6.7% over the three years, averaging out to 97.5¢ more the first year, 90¢ more the second year and 85¢ more the third year, in addition to improved benefits.

IWA turns down any concessions

Give-backs in current or future labor contracts in response to management requests for relief from rising labor costs were ruled out at a recent conference of the International Woodworkers of America in Portland, Ore. That hasn't kept forest products employer groups in British Columbia, however, from continuing to seek wage and other concessions from the IWA and other unions, observers said.

A British Columbia forest products employers group called Interior Forest Labor Relations Ltd. has publicly asked the IWA and Canadian Paperworkers Union to defer a 13% wage increase to take effect for IWA members on June 15 and for CPU workers on July 1.

Forest Industrial Relations Ltd. and Pulp & Paper Industrial Relations Bureau, two larger B.C. forest products employer groups, have talked to the union about the industry's losses but have not asked for any specific concessions, according to an executive at one of the employers groups.

Fourth-quarter mill wages drop

Paper mill employees were paid less at the end of the fourth quarter than at the conclusion of the third quarter and there were fewer of them around to collect paychecks as well, Bureau of Labor Statistics figures showed.

Production worker employment in the paper and allied products industry group fell by 1.9% between December 1980 and December 1981, to 511,000 workers, and preliminary figures indicate January was another 0.4% below December. Employment for the year peaked in September at 531,000.

Employment of female workers—nonproduction as well as production—also peaked in September, reaching 165,000 workers, but in November had fallen to 159,000 employees, a point identical to November 1980 figures. Year-end numbers were not yet available.

Wages were eroded by a drop in weekly hours and overtime which in some cases became acute during the fourth quarter. Average hourly earnings for the whole industry rose slightly in the fourth period but the drop in hours cut weekly earnings by 0.9%, while weekly earnings in pulp and paper mills alone ended the quarter 6.9% lower than in September. In the case of that segment of the industry group, hourly earnings actually fell by 1.2%, although remaining well above December 1980 levels.

Average earnings and hours of production workers in the paper and allied products industry

	Dec. 1981	Sept. 1981	% change for quarter	Dec. 1980	% change year ago
Paper & allied (SIC 26)					
Hourly earnings	$8.96	$8.92	0.4%	$8.27	8.3%
Weekly hours	42.7	43.3	−1.4	43.7	−2.3
Overtime hours	4.2	5.4	−22.2	4.9	−14.3
Weekly earnings	382.59	386.24	−0.9	361.40	5.9
Pulp & paper mills*					
Hourly earnings	$10.43	$10.56	−1.2%	$9.01	15.8%
Weekly hours	44.4	47.1	−5.7	45.3	−2.0
Overtime hours	5.6	8.5	−34.1	6.6	−15.2
Weekly earnings	463.09	497.38	−6.9	435.33	6.4
Paperboard containers & boxes					
Hourly earnings	$7.84	$7.65	2.5%	$7.30	7.4%
Weekly hours	41.3	41.2	0.2	43.4	−4.8
Overtime hours	3.1	3.6	−13.9	4.0	−22.5
Weekly earnings	323.79	315.18	2.7	316.82	2.2

*Does not include figures for paperboard mills, which are similar.
Source: Dept. of Labor, Bureau of Labor Statistics.

DOWNTIME

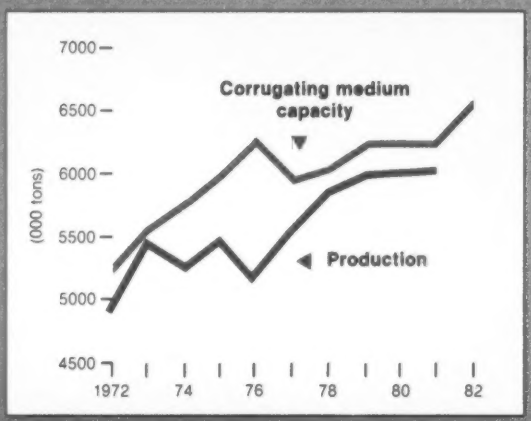
K-C Terrace Bay mill back on-line

Kimberly-Clark of Canada Ltd.'s Terrace Bay, Ont., pulp mill is back on-line again following a fire in the No. 3 digester area that shut down the facility Oct. 30 (P&P, Jan., p. 27). The mill started up in two stages, with one portion resuming operations Mar. 13 and the second part starting up Mar. 19. Production is still nowhere near the mill's 1250-tpd capacity, with output ranging from 700 to 900 tpd most days.

Corrugating medium: Lower box production, inventory cuts hurt demand

Statistics:	**1980**	**1981**	**1982**
Production, 000 tons			
Semichemical[1]	4723	4717	4510
Recycled[2]	1281	1319	1190
Total	6004	6036	5700
Capacity, 000 tons			
Semichemical	4946	4952	5180
Recycled	1330	1332	1385
Utilization rates, %			
Semichemical	95.5	95.3	87.1
Recycled	96.3	99.0	85.9
Imports, 000 tons[1]	31	52	30
Exports, 000 tons[2]	322	140	160
Apparent U.S. consumption			
000 tons	5713	5948	5570
lb/capita	50.2	51.8	48.1
000 tons/$billion real GNP (1972)	3.85	3.94	3.75

[1] API data [2] Bureau of Census data



Estimated capacities of major U.S. companies are:

Annual capacity (000 tons)

	Semi-chemical medium	Recycled medium	Total	Capacity share (%)
1. Owens-Illinois	580	—	580	8.8%
2. Weyerhaeuser	575	—	575	8.7
3. International Paper	485	—	485	7.4
4. Container Corp. of America	235	155	390	5.9
5. Inland Container	175	210	385	5.9
6. Champion Intl.	200	120	320	4.9
7. Willamette Indus.	240	65	305	4.6
8. Mead	300	—	300	4.6
9. Packaging Corp. of America	254	—	254	3.9
10. Stone Container	247	—	247	3.8
11. Virginia Fibre	208	—	208	3.2
12. Smurfit Ind. (Alton Pkging)	—	200	200	3.0
13. St. Regis Paper	63*	132	195	3.0
14. Great Southern	176	—	195	3.0
15. Weston Paper Mfg.	135	—	135	2.1

U.S. capacity (1982): **6.585 million tons**
Capacity share of top five companies: 36.8%
Capacity share of top ten companies: 58.5%

*St. Regis interest in joint-venture machine with Sonoco Products Co.

Grade structure: Corrugating medium includes paperboard made from both semichemical pulp and recycled fiber. In 1981, 78% was made from semichemical pulp furnish (which normally contains at least 20% recycled fiber), and 22% was "bogus" medium, made from recycled fiber. Basis weights of corrugating medium are 22, 26, 33, and 36 lb/1000 ft^2. Standard sheet weight is 26 lb, which accounts for more than 80%. Bogus for equivalent uses is normally produced in slightly higher weights.

Production/capacity: In 1981, production of corrugating medium increased 0.5% over the 1980 level, with semichemical virtually flat and recycled medium up 3.0%, reflecting tight market conditions earlier in the year before box production began to fall off in fourth quarter. Operating rates were also helped by 177,000 tons of inventory building in 1981, which left year-end box plant/mill stocks at a record 704,000 tons.

Capacity for corrugating medium is expected to increase by 4.5% in 1982, 4.9% in 1983, and 2.4% in 1984. Most of the 715,000 tons of new capacity is expected to be in semichemical medium, while recycled capacity remains relatively flat. International Paper Co. started up a 270,000-tpy semichemical medium machine at its new Mansfield, La., mill at the end of 1981, and a 210,000-tpy machine is scheduled to come on line at MacMillan Bloedel's Pine Hill, Ala., mill in 1983.

Outlook: In 1982, total demand for corrugating medium is expected to total 5.7 million tons, down 5.2% from 1981. This is based on a projected 2.3% decline in corrugated container production, which indicates requirements for corrugating medium of about 5.4 million tons. Estimated exports of 160,000 tons and other noncontainer uses of around 240,000 tons are expected to consume another 400,000 tons, offsetting about 100,000 tons of inventory reduction.

Recycled is expected to suffer more than twice the drop of semichemical medium production in this year's soft market.

Pricing: Last $30/ton price increase for 26-lb semichemical medium to $290/ton took place at the beginning of 1981, but rebating in the industry took the price back down to $260 in December/January and back again to that level in May—and possibly into the seasonally weak summer months.

Pricing history of 26-lb semichemical medium in the East is as follows: 1970, $110/short ton; 1971, $120; 1972, $120; 1973, $135; 1974, $185; 1975, $190; 1976, $195; 1977, $185/195; 1978, $210; 1979, $260; 1980, $260; 1981, $290 (list; $260 effective). West Coast prices have been $4.25/ton higher—and since second-quarter 1980, $34.25 higher—due to a sharp rise in woodchip costs.

Semichemical medium is priced $10/ton less than 42-lb kraft linerboard (except on the West Coast) and recycled medium normally sells for about $5 less than semichemical.

Return-on-investment must improve to stimulate Southern tree growing

Forestry expert discusses the trends in growth, planting, and land ownership in the South, and describes methods for improving forest productivity

By KENNETH E. SMITH, Senior Editor

☐ Forest industry experts agree that timber demand in the U.S. will increase dramatically by the end of this century. The U.S. Forest Service predicts that domestic demand for products made from wood will double in the next fifty years. Meanwhile, foreign demand is growing, as Canadian and Scandinavian forests reach the limit of their productive capacity.

The U.S. South is increasingly seen as the most promising area of the world for increased timber production. Approximately 40% of the nation's commercial timberland is in the South. The growth-to-harvest cycle for Southern pine may be as short as 30 years, compared with a 50- to 60-year span for softwoods elsewhere. However, about 72% of that land is owned by private individuals and is not as productive as industry-owned, intensely managed land. Clearly, this privately owned land is the key to meeting future demands for softwood lumber and pulp (see Figures 1 through 4).

To gain a better understanding of the potential of Southern forests and how that potential can be improved,

Figure 1. **Total U.S. timber demand, 1976-2030**

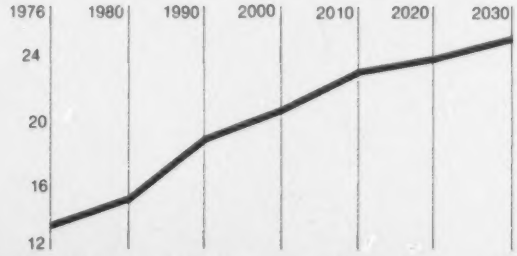


Chart courtesy of National Forest Products Assn.

*Includes demand for softwood and hardwood growing stock (sawtimber and pulpwood)

PULP & PAPER interviewed Dr. William R. Sizemore of Sizemore & Sizemore, a Tallassee, Ala.-based company offering forestry appraisal, analysis, and management throughout the U.S.

Dr. Sizemore received a B.S. degree in forestry from La. State Univ., a master of forestry from Duke Univ., and a PhD from the Univ. of Ga. He is a registered forester in 12 states and a registered land surveyor in Ala. and Fla. He has held appointments as adjunct professor of forestry at Auburn Univ. and as lecturer at Duke Univ. He is now an adjunct professor of forestry at Duke.

P&P: *Dr. Sizemore, what is the current annual production of Southern forests? What could that production be by the year 2000? What is it likely to be if current trends continue? What is the current ratio of growth to cut in the South?*

Sizemore In 1977, the growing stock inventory for Southern forests, both softwood and hardwood, was 230,037-million ft³. In 1976, roundwood production from growing stock for both species groups in the South was 5511-million ft³. Predicted roundwood production for both species groups for the year 2000 is 8060-million ft³.

If there is a continuation in current trends of timber production, net annual growth of softwood trees will rise until it peaks in 2010. Failure to maintain an adequate flow of small dia softwoods into larger-size classes will be a major contributing factor in this growth peak.

The net annual growth of hardwoods will be similar to that of softwoods. Growth will peak in 1990 and will continue to decline until 2030.

If there are any changes in these projected growths, they will not affect projected timber supplies unless there are definite changes in current inventories. The 1976 net annual growth of pine and hardwood in the South was 10,705-million ft³. The net annual removals for the South in 1976 was 6572-million ft³. This results in a 1.6:1 ratio of growth to removals for both pine and hardwood.

The situation with respect to softwoods is much less favorable. For example, 54% of the loblolly pine acreage

harvested between 1961 and 1972 was not regenerated back to loblolly. This failure created an age-class gap that is giving the forest industry supply problems.

P&P: *Despite a growing demand for forest products, isn't it true that each year much land is lost to commercial timber production? Why isn't this land replanted? Don't the tax breaks available to forest landowners provide enough incentive for them to replant?*

Sizemore When one thinks of land being lost to commercial timber production, the general image is forestland being converted to shopping centers, highways, soybeans, pasture, or other uses. And it's true that this happens every year in every state where there are significant forestlands. The impact is lessened by those lands moving into forestry by default; that is, abandonment of a higher and better use. Nationwide, more acres are going out of commercial forestry than coming in. In some areas, like Miss. and La. bottomlands, the trend is drastic enough to cast a cloud on the future of some wood-using plants.

No incentive exists today—and logically shouldn't—to stop the conversion of forestlands to a clearly higher and better use. What is truly alarming is the reverse movement to the lowest and worse use; that is, just holding the world together. And this is what happens when all of the growing stock is removed from forestlands and nothing is done to restock it.

Tax breaks won't stimulate reforestation; it's going to take one or more technological breakthroughs.

P&P: *Could you give examples?*

Sizemore We need **genetic improvements** permitting the harvest of pulpwood-sized pine in eight years that will command a price/cord at least equal to current rates; a **logging system** that would permit cost-effective harvesting of as little as 10 acres of moderately stocked pine or hardwood; and **a way to grow intolerant trees** (such as southern pine) at acceptable yields in all aged stands; and **harvesting methods** that would avoid damage to residual stands.

There are breakthroughs that we can dream about, but these four have something in common—they would reduce the waiting period between investment and return and provide sufficient return to attract the attention of the financial community. Maybe timber ownership could shed its current capital-intensive, long-horizon image.

P&P: *How much forestland in the South is in plantation?*

Sizemore Commercial forestland in the South totals about 188 million acres. According to the U.S. Forest Service, only 1.3 million acres were planted in the South in 1977, of which 1.1 million acres were industry lands. From 1950 to 1977, 38 million acres were planted nationwide, of which 24 million were planted in the South. Industry plantings in those years totalled 15.2 million acres, or 63%. I know from direct observation that many early plantings have been cut, so I doubt if we have more than 20 million acres of plantation, or about 11% of our commercial forests, remaining in the South.

P&P: *How does the productivity of privately owned timberland compare to that of managed forestland owned by paper companies?*

Sizemore In the answer to an earlier question, I mentioned our long-horizon image. The answer to this question depands on the horizon of reference. If you are talking about M.A.I. (mean annual increment, or the average growth per acre from planting to harvest), the forest products industry is way ahead. If you are talking about current annual increment (that is, the growth for one year), the nonindustrial private owner leads. If the horizon reference is periodic (some period less than the rotation length—say ten years), the two ownership classes are about even. The reason for the differences is that from 25% to 50% of industry's lands are awaiting reforestation or are in young trees not yet having merchantable volume, hence no recognized growth.

P&P: *Do genetic species improvement and fertilization promise to have much effect on future Southern timber production? What about the introduction of new species, like rapidly growing eucalyptus?*

Sizemore Any significant impact of genetically improved trees is at least a half rotation away. This means that significant results are about 15 years away in the South, and 25 years in the Northwest.

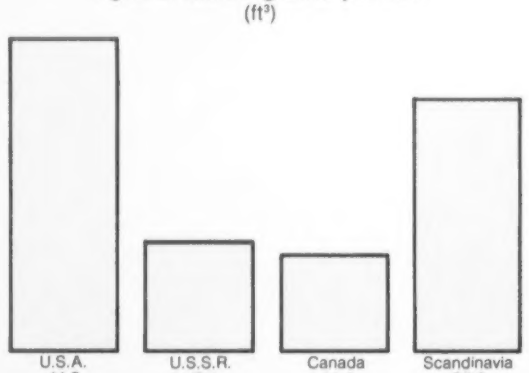
Rapidly growing species do offer some hope. Cottonwood shows promise, but it's a short-fibered species, and the most probable continuing, heavy demand is for long-fibered species. A long-fibered, truly frost-resistant eucalyptus would be a technological breakthrough.

I am familiar with fertilization techniques only in the South. My feeling is that economic feasibility of fertilization is highly site-specific. Thus, economy of scale is an overriding consideration. Costs force us to use a meat axe when we need a scalpel. We're still in the learning stage with nitrogen use, but I think phosphorus used in poorly drained sites is a real winner. If you don't believe it, ask Brunswick Pulp & Paper Co. to show you some of their plots which are approaching pulpwood size.

P&P: *How can Southern private landowners be encouraged to plant more trees and properly manage existing stands? What are the forest products and paper industries doing to encourage more private tree growing?*

Sizemore I'm a private forestland owner myself, and I have never planted any significant acreage of seedlings without government assistance. I did most of my planting under the Conservation Reserve Program of the Soil Bank. If you'll look at the graph of acres planted by year for the nation [see Figure 5], you'll find that the active period of that program is the only significant upward

Figure 2. **Annual growth per acre**
(ft^3)



Source: National Forest Products Assn.

bulge in planting activity that we have ever had. It would take that kind of program to pull me back into active planting. I firmly believe and support the intensive forestry that industry is practicing. But, forest products firms have an almost unlimited horizon. I have to look backward to see mine. More than half of the nation's nonindustrial forestlands will be involved in estate proceedings in the next 20 years. I'm not atypical.

By taking advantage of partially stocked natural stands, the current annual growth of my forestland has been above average; and, for the first 28 of 30 years, my periodic annual growth was much above average. If the southern beetle hadn't gotten to me, I'd still be above average. This strongly suggests that "acres planted" is not always the measure of the quality of management.

P&P: *As demand for timber and pulpwood grows, do you see major forest products companies buying/owning the majority of the South's commercial timberland?*

Sizemore Industry ownership could reach 50%, and that would make the answer to your question "yes." However, as long as the success of a firm is measured by current financial standards, it's doubtful that industry ownership will get to that level. It appears that "patient money" is taking a real interest in timberlands, and if that is the case, we may see drastic changes in land ownership patterns. The real motivation for forest industry ownership is stabilization of raw material cost. If the desired stabilization is achieved, investments in timber growing measured by annual cash return turn out to be mediocre. If patient money were to come to dominate timberland ownership, informed sellers would call the tune with respect to prices. Thus, the good news is that the timber would be there; the bad is that prices would be higher.

P&P: *Will the increased use of biomass for fuel in the South have much effect on the price and supply of pulp chips? What about the increasing production of oriented-fiber panels made from pressed chips?*

Sizemore Chips for pulp are currently more valuable than chips for fuel. I can't see energy prices changing this relationship. So far, the oriented-fiber panels require a higher-quality furnish than that for fuel chips. The prospects for using pine chips for panels are still hazy. I personally think that the bugs have not yet been worked out of the use of a multispecies furnish for panels. I hope that the use of odd species and below-grade material for fuel chips continues to grow. Site preparation and planting costs behind biomass operations are significantly cheaper. That means we'll get more trees in the ground.

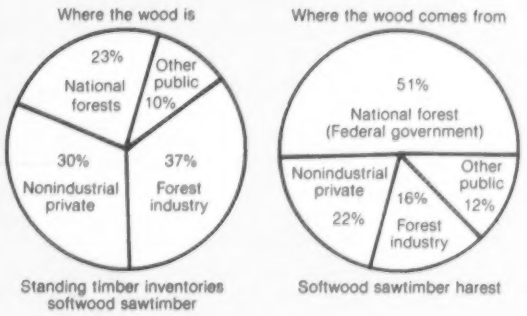
P&P: *Has the current housing industry slump had a big effect on pulp chip supply and pricing since most pulp chips are byproducts of lumber operations?*

Sizemore The housing industry slump has significantly reduced the supply of chips from lumber operations, both independent and captive. Chips have been generally priced as byproducts. This is why remote chipping plants have not become a major influence in the industry. Pulp plants have not been able to stand full costing of chips. Before the softening in pulp prices and after the downturn in lumber prices, several firms tried running Chip-N-Saws as chip producers only. The result was full costing of chips—an untenable situation for the pulp mills. In many cases, it was cheaper to shut down facilities and buy more roundwood. Many believe that the continuing relatively high level of stumpage prices is a result.

P&P: *What percent of current Southern timber production is pulpwood, chips, plywood, and lumber?*

Sizemore In 1976, pulpwood production (including chips) accounted for 43% of total roundwood production. The lumber industry consumed 40% of the total production and plywood plants used 10%. □

Figure 3. **Breakdown of standing softwood sawtimber inventories and harvest**



Source: National Forest Products Assn.

Figure 4. **Private nonindustrial lands productivity: wood consumer goals compared with 1980 Resources Planning Act**
(billion ft³) softwood timber

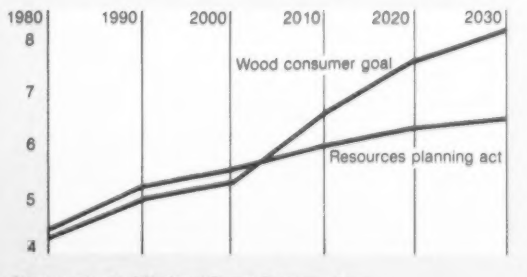


Chart courtesy of National Forest Products Assn.

Figure 5. **Planting and seeding on private, nonindustrial lands in the U.S., 1952-1980**

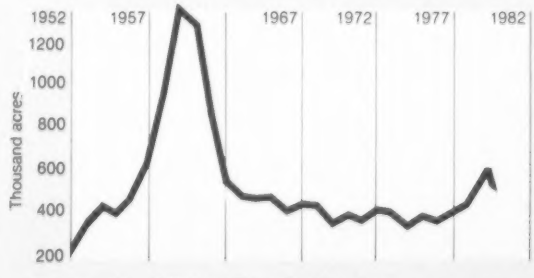


Chart courtesy of National Forest Products Assn.

Effects of tax laws on forest yields—U.S. vs Finnish system

In parts of U.S. (Alabama), tax policies may favor nonmanagement of forestland; in many countries (Finland), taxes penalize lack of management

By ROBERT W. HAGLER

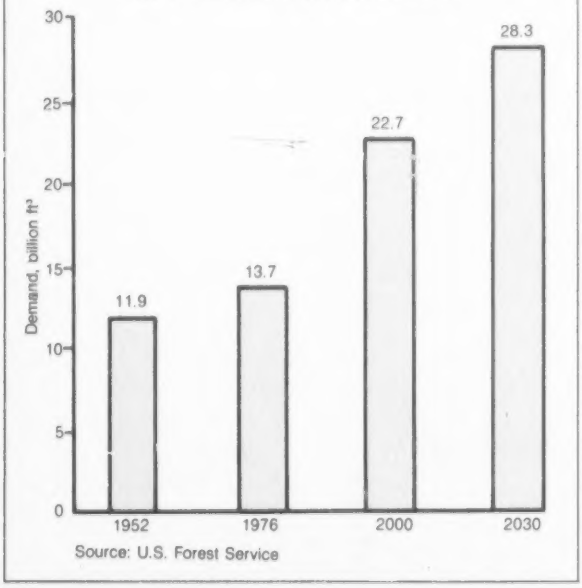
☐ According to a recent General Accounting Office report, the U.S. faces an enormous increase in demand for its wood in the next 50 years (Figure 1). From a 1977 level of 13.7 billion ft³, demand is projected to reach 22.7 billion ft³ by the year 2000 and 28.3 billion ft³ by 2030. If market forces are allowed to bring about a wood supply/demand equilibrium, prices are likely to skyrocket. For example, in the southeast U.S., prices would have to almost quadruple to $526.80/1000 bd ft by 2030 to equalize supply and demand.

On the other hand, if current price trends are assumed, the Forest Service projects a softwood sawtimber shortage of more than 2 billion ft³ by the year 2030. U.S. wood resources will be further drained by a projected increase in export demand for timber to more than 1.5 billion ft³ by the year 2000. Tight domestic supplies could have a dampening effect on future exports at a time when the U.S. will already have a trade deficit.

This gloomy forecast, combined with the increasingly large amounts of committed capital required to buy and hold large areas of forestland, has put new emphasis on the role of the private, nonindustrial forest landowner. For well over 25 years the U.S. Forest Service and the forest products industry have spent millions of dollars on programs to encourage private landowners, seen as the key to assuring future wood supplies, to increase productivity of their timberlands. But these programs have not been notably successful. One of the chief impediments appears to be the current forest tax structure. This article considers the question of whether alternative ideas and tax systems might help to motivate more efficient and intensive use of this nation's vast private forestlands.

Mr. Hagler is a forest products consultant with Arthur D. Little Inc., Cambridge, Mass.

Figure 1. **Demand for U.S. timber**



Source: U.S. Forest Service

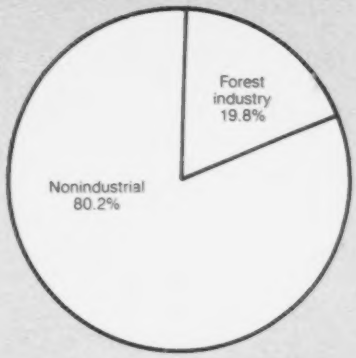
The unmet potential

Only 20% of all privately owned timberland in the U.S. belongs to the forest industry (Figure 2A); the remainder, about 278 million acres, is held by nonindustrial landowners. A recent Forest Service assessment states that 45% of the latter, or about 124 million acres, could be considered to have economic potential for timber ventures. If this land were intensively managed on a continuing basis, it could add as much as 9.1 billion ft³ annually to the nation's wood supply—almost one-third of the projected 2030 demand.

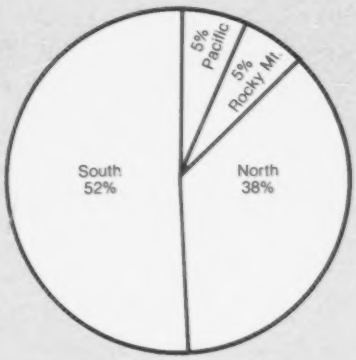
The South has special potential in this respect, since it contains 52% of the nation's total private nonindustrial commercial forestlands (Figure 2B). While the region's favorable growth rates, species mix, and geography make it particularly amenable to intensive forest management, Forest Service statistics indicate that privately owned southern forests averaged only 45% of their potential growth per acre in 1976. This clear lack of intensive

Figure 2. **Forest ownership breakdowns, U.S. and Finland**

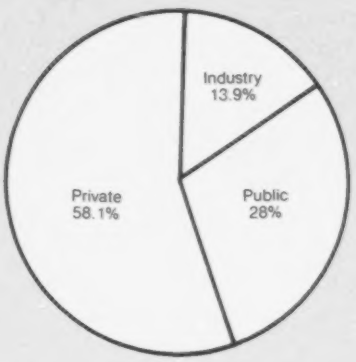
A. U.S. private commercial forestland ownership (1977)



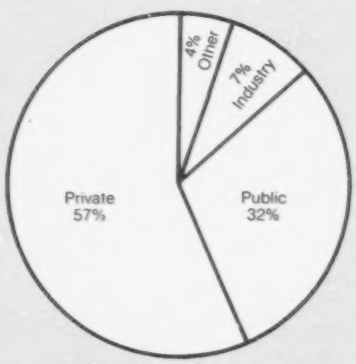
B. Regional location of nonindustrial U.S. forestland



C. Forestland ownership in U.S. (1977)



D. Forestland ownership in Finland (1976)



Source: U.S. Forest Sevice and *Finnish Yearbook of Forest Statistics* (1976).

management reflects four basic problems:

- Low level of plantation establishment
- Failure to harvest timber at economic intervals
- Reluctance to reforest, even where it would be economically effective
- Failure to use thinnings/grown fiber in final harvest.

In view of the fact that southern timber growers are offered both state and federal forestry incentive programs, industry-backed landowner assistance programs, and Tree Farm Program of the American Forest Institute, this situation is paradoxical. It appears that these efforts are being thwarted by a forestland taxation policy that penalizes rather than encourages management.

U.S. forest tax policy

Because of the extremely long time between planting and harvesting, certain problems are inherent in all forest investments. One of the most serious of these is a (usually) low present value of a timber crop and an unimpressive financial return. For example, a stand of timber that takes 40 years to mature and is worth $10,000 when harvested has a present value of about $221 at a discount rate of 10% annually and only $37.33 for a 15% rate. Although simplified, this example illustrates the magnitude of the problem.

In an attempt to increase the return on investment for timber growing to levels that are at least competitive with alternative investments, state and federal governments have introduced laws to reduce the tax burden on the owners of forestland. One of the first such laws in the U.S. was passed in 1921 and allowed those who held timber for a specified period of time to qualify for capital gains tax rates rather than higher personal income tax rates upon "lump-sum liquidation" of their holdings.

To encourage long-term timber management, this policy was extended in 1944 to sale of timber under long-term cutting contracts. States then began passing special forest property tax treatment laws—many during the last 20 years—aimed at reducing or eliminating tax burdens during timber rotation and levying them at harvest time, when an income was realized. The goal of these tax policies is to try to make forest management financially acceptable by supplying financial aid at the front end of the operation, reducing mid-rotation costs, and increasing the return by reducing the initial investment.

Since 1914, specific government aid to motivate private nonindustrial forest management has intensified in the form of free or discounted forest management services and fire protection. Examples are the Smith-Lever Act of 1914, Clark-McNary Act of 1924, the Norris-Doxey Farm Forestry Cooperative Act of 1937, Cooperative Forest Management Act of 1950, and the recent Reforestation Tax Incentives of 1980.

Despite this government assistance, few privately owned nonindustrial forests in the U.S. are as intensively managed or have yields as close to their potential as forests in other countries. The explanation does not seem to lie solely in the abundance and relatively low price of U.S. timber; part of the reason is a fundamental difference in tax policy.

Penalties vs rewards

Essentially, the policy in the U.S. toward forest taxation is designed to make forest management financially

acceptable. An opposing philosophy used in many parts of the world is to make forest nonmanagement financially unacceptable. These two difference approaches—making a socially beneficial action more attractive vs making failure to act more unattractive—are two means of reaching a similar end and represent the classic contrast of the carrot and the stick. A comparison of examples of how each policy is applied to forest taxation will help show their different effects on forest management.

Alabama's forest tax policy typifies the approach used in much of the U.S. As in most other states, its taxes are designed to reduce front-end and mid-rotation costs, thereby making the managed forest more attractive. A private landowner in Alabama who owns, for example, 50 to 60 acres of loblolly pine plantation on a 30- to 40-year sawtimber rotation is eligible for the following aid and is responsible for the following taxes:

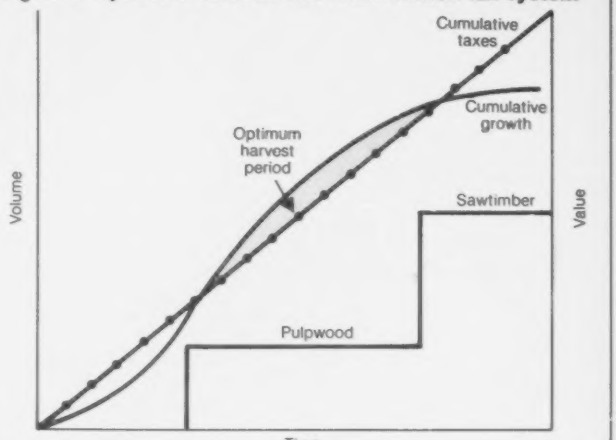
- Federal and state aid on a cost-sharing basis for plantation establishment and fire protection
- Automatic exemption on the value of the timber from local taxes, whether the forest is managed or not
- Assessment of the timberland at 10% of market value for ad valorem property taxes, which is at least 5% below the rate on other properties
- Imposition of a severance tax on "persons in the business of severing forest products" at harvest time
- State income tax and federal capital gains tax paid on harvest income.

The opposite tax philosophy—to make forest nonmanagement financially unacceptable—is exemplified by Finland, whose forests are generally acknowledged to be operating at the highest possible sustained yield. Despite a very different form of government, forestland ownership patterns in Finland in 1976 resembled those in the U.S. (Figures 2C and 2D). A private owner of 25 hectares (about 60 acres) of pine plantation in southern Finland on a 70- to 80-year rotation (due to slower growth rates) is eligible for the following aid and responsible for the following taxes:

- Government aid for the initial establishment of the plantation; in some cases, this includes exemption from any taxes until the timber crop is ready for the initial commercial thinning
- Annual income taxes imposed on the basis of presumed income per hectare. (For this purpose, the country is divided into 12 tax districts. Within each district, forestland is assigned to one of five "site capability classes" corresponding to its tree-growing potential. The number of hectares in each tax class on an owner's land is multiplied by the "forest tax figure," which is related to the average forest growth in that tax district, yielding a tax unit called a "tax cubic meter." The number of "tax cubic meters" presumed to be grown on an owner's land in a year is then multiplied by a "mean money value," a three-year average of prevailing local stumpage values. The result is the taxable "income" on which the owner must pay income tax. Deductions can be made from this "income" for owner management/administrative costs.)
- No harvest taxes, since taxes are paid throughout the rotation period.

These two approaches to forest taxation represent the extremes of a very wide spectrum; many other nations have intermediate philosophies. A comparison of the Alabama and Finnish systems is made to demonstrate the potential impact on the management of nonindustrial private forestlands. To make the comparison valid, certain assumptions have been made:

Figure 3. **Optimum harvest time with Finnish tax system**



- The land of both the Finnish and the U.S. landowner is zoned for agricultural use, so there is no pressure to sell it for development
- The land is already owned (tax effects on bid prices for forestland involve many issues beyond the scope of this article)
- The use that minimizes annual taxes is "forestry"; that is, the tax rate is lower than that on "agricultural cropland" and "improved land."

Comparison of U.S. and Finnish policies

Plantation establishment. The Finnish system gives owners a strong incentive to capture the most growth possible from forestlands because the government bases its taxes on average growth levels. This almost always leads to intensive plantation forestry because yields can often be doubled over those of natural, untended stands. Government loans are generally available for establishing plantations, and taxes can be waived until the timber is ready for its first commercial thinning.

Alabama also provides cost-sharing funds to promote plantation establishment and, as already mentioned, exempts timber from ad valorem taxes. But the law does not distinguish between a new pine plantation and a naturally reseeded scrub hardwood stand. Since the owner is eligible for the same special tax treatment whether or not he establishes a new plantation, there is no tax incentive to do so.

Thinning and harvest utilization. The Finnish forest tax system pressures an owner to maximize his yields. If a precommercial thinning will increase the growth rate of his trees and keep it above average, it is done. Commercial thinning helps to recoup planting and other front-end expenses. For the same reason, a forestland owner in Alabama is apt to commercially thin his stands.

Finland provides incentives to make the final harvest intensive and complete. The owner who has paid taxes for presumed growth for many years is motivated to realize as much of his investment as possible. Similarly, the forestland owner in Alabama is motivated to harvest intensively to maximize his profits. Thus, both tax systems provide similar incentives at this stage in plantation management.

Table 1. **Summary of tax effects on forest management practices**

Management method	U.S. (Alabama)	Finland
Plantation establishment	Financial aid available No tax incentive	Financial aid available Strong incentive, since taxes are paid on presumed growth
Thinning	Cost-sharing aid available Some incentive to recoup front-end costs	Tax deductions possible Strong incentive to increase growth rate and recoup front-end costs
Economic harvest	No tax-related incentive to harvest timber at an economic time. Incentives exist to leave timber standing indefinitely	Strong incentive to harvest while growth exceeds "average" growth on which taxes are based
Reforestation	Because owner is automatically eligible for special tax treatment, he has no incentive to absorb costs of reforestation	Strong incentive to get idle acres back into quality timber production

Harvest timing. In probably no other management aspect are the two tax systems more different than in their effect on the timing of timber harvests. Finland's system closely associates silvicultural and economic maturity (Figure 3). As long as the owner's current annual increment (the growth of his stand this year) is greater than the mean annual increment (the average growth on which his tax is based), he is earning tax-free income. As the stand matures, however, growth slows. When the two rates become equal, it is time to harvest and reforest with faster-growing young trees.

In Figure 3, the optimum time for harvest is shown as the shaded area. Harvesting is generally done during this period because at any later time the Finnish owner will be paying taxes on growth his stand is not producing.

One might expect the Finnish tax system to favor harvesting a high percentage of pulpwood and minimal volumes of sawtimber, because several more years' taxes must be paid before trees reach sawtimber size. However, timber increases in value by a stepwise rather than linear function (Figure 3), and the size of the step is large. Thus, owners of forestland often find the added expense to be justified. Moreover, the government can, if it chooses, reduce the slope of the tax line by selecting a longer rotation period. This extends the optimum harvesting period and reduces the incremental tax burden.

In the U.S., there is no similar harvest trigger point for the private landowner. He has no tax incentive to harvest timber at any particular time for either silvicultural or economic reasons. Harvesting may depend on the financial maturity of his stand, attainment of a particular timber size class, or maximization of current annual increment or net present value. For most owners, however, it probably hinges on when the going price seems good, a more attractive investment is found, an unexpected expense arises, or the owner retires. If none of these events occurs, the trees may remain untouched for years, particularly if the stand has been unmanaged. When they are finally harvested, the owner is liable for capital gains taxes, state income taxes, and possibly higher ad valorem taxes due to declassification of the forestland.

Reforestation. Although timber plantation establishment, thinning, and timing of harvests all affect future timber supply, cost, and availability, the most serious threat to this nation's future timber supply is the extremely low level of reforestation of private nonindustrial forestlands. In 1978, only 7.8% of Alabama's nonindustrial private forestlands were reforested after harvest. This low rate, which is typical of most states, means that an excessive area of land is being allowed to revert to lower-quality timber, with a resulting loss of growing time and reduction of timberland productivity.

The reason for such a low reforestation rate—at least in Alabama—is almost certainly that owners receive the same tax treatment for a naturally regenerated hardwood stand as for a capital-intensive pine plantation. (Recent legislation—HR4310—provides the first positive tax incentive for reforestation. However, it was passed too recently for its effects to be noticeable and may benefit primarily the larger nonindustrial private landowners.) Moreover, since a second rotation will often extend beyond the landowner's lifetime, he has little personal incentive to maximize the productivity of the stand.

By contrast, the law in Finland (and in several U.S. states) requires that timberlands be reforested after harvest or reclassified for some other use. Even in the absence of such a law, Finland provides strong incentives to get the land back into above-average production as soon as possible. Since taxes are based on average growth (perhaps of naturally regenerated stands), the landowner is encouraged to maximize forest growth beyond the level for which he will be taxed in any case.

Table 1 summarizes the impact of the two alternative tax systems on forest management. Alabama's system is clearly unrelated to intensive forest management and provides little incentive for investments by private landowners. A Finnish landowner can also own large tracts of unproductive timberland or let his trees go unharvested past maturity, but he will pay a price for keeping these resources idle and underutilized. Thus, Finland's forest tax incentives have been successfully aligned with the goal of maximizing the long-term yield from its forest resources.

Two "productivity taxes"—Western Oregon Small Tract Optional Tax and Florida's Green Belt Law—are currently on the books in the U.S. However, there is a significant difference between these and Finnish law. Annual growth is not directly considered in the U.S. laws; they simply modify the assessment of the value of the forestlands. More specifically, they base "annual income" on the entire rotation and capitalize it back to the present at current or estimated prices. Finland does not look at in-

come-earning ability over an entire rotation; it taxes current annual growth at current prices, which are adjusted each year.

Applicability of the Finnish system

Would Finland's productivity tax system work in Alabama? And if it were introduced, what impact would it have on southern forestry? These are not easy questions to answer. Such a drastic change in the way forestland is taxed would create much initial uncertainty. Many owners, unwilling or unable to make the capital investment or pay the taxes, would probably sell their land. (Some experts believe that a major shift in ownership in the South is inevitable regardless, and that introduction of a Finnish-type system would simply accelerate this trend.)

The effects on the forest products industry would likewise be substantial. Large timberholding companies would be forced to cut surplus inventories and replace slow-growing, mature trees, but after a few years of adjustment they would probably benefit from the increased supply of wood on the market. This might moderate future price increases and allow the U.S. to remain a low-cost producer of fiber for the rest of the world.

For several reasons, however, it is likely a Finnish-type tax system, unaltered, would not work in the U.S.:

- The amount of government "oversight" needed to run the system might not be tolerated
- The idea of intensive, high-cost forest management is not widely accepted here due to the historic abundance of our natural resources; private nonindustrial landowners would have to undergo a major change in attitude
- A key reason the system works in Finland is the abundance of government aid, which makes investors' money more "patient" (investors in U.S. forest industries might turn elsewhere if such a tax system were introduced in the absence of government aid)
- Finland's forest industries are the backbone of its economy and foreign trade; its strong farmer "unions" negotiate the prices (not the case in the U.S.).

Nevertheless, although Finland's system would probably be unworkable here in its present form, those who formulate U.S. tax policy should not ignore its underlying principles and their effectiveness in promoting full utilization of relatively limited forest resources.

A U.S. alternative

A hybrid system that avoids some of the problems and incorporates the advantages of the Finnish system could prove very successsful in the U.S. If, for example, nonproductive or idle forestland were subject to a special tax, the proceeds could be applied to reforestation and cost-sharing programs. This would promote better forest management and also create an incentive for owners to utilize the programs. The recycled funds might also help to lower front-end costs, thereby making forest investments attractive as well as necessary.

The problem of future fiber shortages begs to be addressed in a broad forum. It seems that small federal subsidy programs and tax reductions have not been sufficient inducements for forest management in this country. The total tax burden on U.S. timber investment need not be increased; the essential task is to structure the tax system to encourage forest investment and to create strong incentives for efficient forest management. □

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Weak fertilizer markets ease sulfur supply

By BARRY SHOCKETT

The U.S. sulfur market, which had been characterized by a tight supply up until mid-1981, has loosened further due to continuing slow fertilizer, and thus, sulfuric acid demand.

Domestic Canadian demand has been decreasing since 1978, but exports to U.S. and offshore markets have risen steadily. New Middle East capacity may threaten Canadian producers markets, especially in Western Europe.

SULFUR

UNITED STATES

Uses: Sulfite pulp mills consume most of the sulfur that is used by the pulp and paper industry; some is also utilized by kraft mills. The largest end-use (80%) of sulfur is the production of sulfuric acid.

Demand: The pulp and paper industry used 100,000 metric tons of sulfur in 1981, up 6.4% from the 94,000 tons consumed in 1980. Total consumption (excluding byproduct sulfur) in 1981 was 11.56 million tons, down 8% from the 12.58 million tons of 1980.

Sources: Sulfur is produced in two ways: Frasch and recovered (from refineries and natural gas production). Major producers are: Frasch-Duval, Freeport Sulfur, and Texasgulf, Recovered-Shell, Exxon, Standard (Calif.), Standard (Ind.), and others.

Availability: In general, sulfur is readily available due to current weak demand and growth in capacity. 1981, tight to market; 1980, tight; 1979, very tight; 1978, market to tight.

Pricing: The price at year-end for Frasch sulfur, f.o.b. Gulf Coast ports, had risen to $138.77/metric ton, however weak demand resulted in the price dropping to between $120 and $125/metric ton by the second quarter of 1982. Price history: 1981, $131.35-$138.73/metric ton, crude, bright, f.o.b. Gulf Coast ports; 1980, $103.31-$109.05/metric ton; 1979, $70.60/metric ton; 1978, $61.50/metric ton. Recovered sulfur is quoted at about $20/metric ton below Frasch prices.

Forecast: Additional sulfur capacity, to be brought onstream soon, will ensure an adequate U.S. supply. New capacity in the Middle East will increase global capacity, and could result in weak pricing.

U.S. production, consumption, elemental sulfur (000 metric tons)

	1978	1979	1980	1981†	1982e
Capacity	13,000	13,000	14,540	15,300	16,000
Production**	10,011	10,827	10,785	10,914	11,300
Shipments*	10,125	12,015	11,837	10,434	10,500
Imports	2177	2494	2523	2522	2400
Exports	866	2044	1782	1392	1300
Apparent consumption	11,436	12,465	12,578	11,564	11,600
Sulfuric acid	8993	9547	10,257	9200	9500
Pulp and paper	96	124	94	100	100
Other††	2347	2794	2227	2264	2000

*Excluding sulfur content of byproduct H_2SO_4, H_2S, and SO_2
†Preliminary figures
**Recovered and Frasch sulfur only
††Including agchems, paints, petroleum refining, rubber and other plastics, inorganic chemicals, etc.

Source: U.S. Bureau of Mines

Canadian sulfur statistics (000 metric tons)

	1978	1979	1980	1981	1982e
Capacity	11,835	11,586	12,024	12,089	12,500
Production	5868	6313	7628	8192	8200
Shipments	5790.5	6077.8	7818.7	8310	7921
Imports	8	1.7	1.8	4.6	4
Exports					
U.S.	1185	1265	1517	1666	1500
Offshore	3803	3915.5	5315.5	5796	5600
Domestic demand	814	924.5	888	852.5	825
Sulfuric acid	486	594	575	540	530
Pulping	278	279	262	257	235
Other*	50	51.5	51	55.5	60

*Including carbon disulfide, hydrogen sulfide, rubber, asphalt, soil nutrients, and others.

CANADA

Uses: Sulfite pulp mills use sulfur to produce cooking liquor, Some is used to generate chlorine dioxide. The major use is for sulfuric acid production.

Demand: Pulp mills used 257,000 metric tons of sulfur in 1981, or 30% of total consumption, down slightly from 1980.

Sources: All sulfur produced in Canada is recovered.

Availability: By late 1982 or early 1983, capacity will grow almost one million metric tons, ensuring an adequate supply. 1981, tight to market; 1980, tight; 1979, tight.

Pricing: The average price of sulfur for North American shipments climbed 60.5% in 1981—to $63.22/metric ton, f.o.b. Alberta producing points from $39.36/ton in 1980. Currently, Alberta sulfur list prices are $80-$85/ton. The average export price for offshore markets last year, f.o.b. Vancouver, was $125/ton, while the f.o.b. Alberta price for export shipments was $93/ton. At the beginning of the second quarter, export sulfur was priced at between $96-$110/ton. Pricing history: 1981, crushed, slate, or molten, f.o.b. producing point, $59.58-$74.48/metric ton; 1980, $32.76-$59.58/metric ton; 1979, $24.82-$29.79/metric ton. (Note: prices are in Canadian dollars.)

Forecast: Increased mechanical pulp capacity will continue to decrease sulfur use by sulfite pulp mills. Total consumption may be one million tons by 1986 if economic factors improve.

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